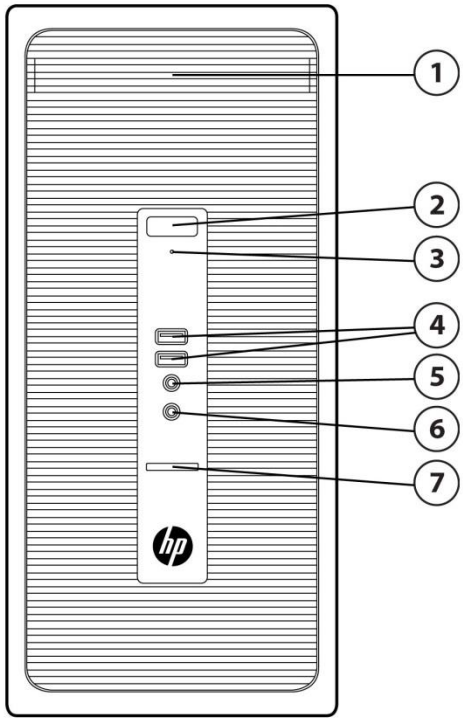
Overview

HP ProDesk 490 G2 Microtower Business PC



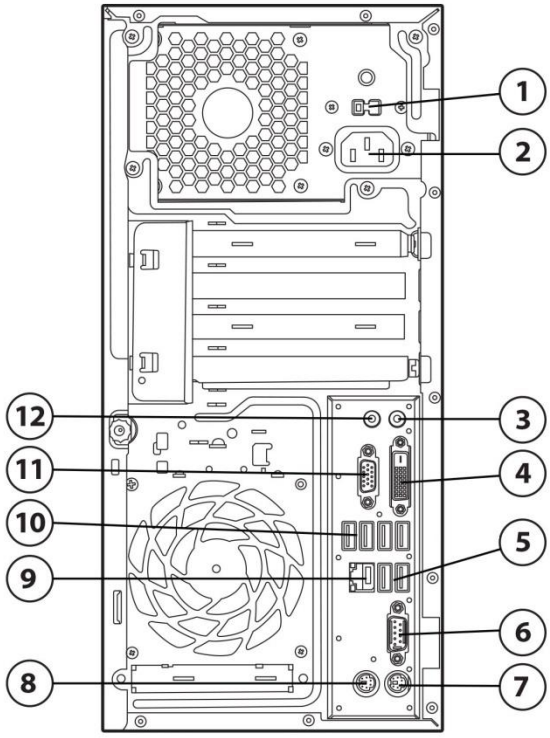
1. Slimline Drive Bay - supporting an optical disk drive (optional)
2. Power Button
3. PC Status LED
4. (2) USB 3.0 Ports (blue)
5. 3.5mm Microphone Jack
6. 3.5mm Headphone Output
7. SD Card Reader

Not Shown

Slots (1) PCI 3.0 Express x16 graphics connectors
(1) PCI 2.0, x4 Slot (using PCIe x16 connector)
(2) PCI Express 2.0 x1 Accessory Connectors

Bays (2) 3.5” internal storage drive bays (1 bay can be configured as 2.5”)

Overview



1. Voltage Select Switch (included on some models only)
2. Power Cord Connector
3. Line-Out Connector for powered audio devices (green)
4. DVI-D Monitor Connector
5. (2) USB 3.0 Ports (blue)
6. RS-232 Serial Connector
7. PS/2 Keyboard Connector (purple)
8. PS/2 Mouse Connector (green)
9. RJ-45 Network Connector
10. (4) USB 2.0 Ports (black)
11. VGA Monitor Connector
12. Line-In Audio Connector (blue)

Not Shown

Parallel Port (optional); 2nd RS-232 Serial Port (optional)

Overview

At a Glance

- Redesigned expandable, upgradable Microtower chassis
- Intel® H97 Express chipset supporting Intel 4th generation Core processors, featuring integrated Intel HD Graphics
- HP developed and engineered UEFI BIOS supporting security, manageability and software image stability
- Realtek RTL8151GH-CG GbE LOM integrated network connection
- Up to 32GB DDR3 Synchronous Dynamic Random Access Memory (SDRAM)
- Multi-independent monitor support via VGA and DVI-D video interfaces, with optional Display Port 1.2
- Discrete graphics options available for all platforms
- DTS Studio Sound™ audio management software
- Standard and high efficiency energy saving power supply options
- ENERGY STAR® qualified models certified EPEAT® Gold
- Can be configured with multiple drives in a RAID array
- Optional Intel Smart Response Technology disk cache modules
- 1 32GB SATA SSD Cache*

* 32GB SATA Internal Solid State Drive (SSD)

NOTE: See important legal disclosures for all listed specs in their respective features sections.

Standard Features and Configurable Components

OPERATING SYSTEMS

Preinstalled When Purchased

Windows 8.1 Pro (64-bit)*
Windows 8.1 (64-bit)*
Windows 7 Ultimate (32-bit)**
Windows 7 Ultimate (64-bit)**
Windows 7 Professional (32-bit)**
Windows 7 Professional (64-bit)**
Windows 7 Professional (32-bit) (available through downgrade rights from Windows 8.1 Pro)***
Windows 7 Professional (64-bit) (available through downgrade rights from Windows 8.1 Pro)***
Windows 7 Home Premium (32-bit)**
Windows 7 Home Premium (64-bit)**
Windows 7 Home Basic (32-bit)**
FreeDOS 2.0

*Not all features are available in all editions of Windows 8.1. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8.1 functionality. See http://www.microsoft.com.

**Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

***This system is preinstalled with Windows 7 Professional software and also comes with a license and media for Windows 8.1 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

Standard Features and Configurable Components

PROCESSORS*

Intel® 4th Generation Core™ i7 Processors

Intel® Core™ i7-4790 Processor
Up to 4.0 GHz Max. Turbo Frequency (3.6 GHz base frequency)
8 MB cache, 4 cores, 8 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i7-4790s Processor
Up to 4.0 GHz Max. Turbo Frequency (3.2 GHz base frequency)
8 MB cache, 4 cores, 8 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i7-4770 Processor
Up to 3.9 GHz Max. Turbo Frequency (3.4 GHz base frequency)
8 MB cache, 4 cores, 8 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i7-4771 Processor
Up to 3.9 GHz Max. Turbo Frequency (3.5 GHz base frequency)
8 MB cache, 4 cores, 8 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i7-4770S Processor
Up to 3.9 GHz Max. Turbo Frequency (3.1 GHz base frequency)
8 MB cache, 4 cores, 8 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® 4th Generation Core™ i5 Processors

Intel® Core™ i5-4690 Processor
Up to 3.9 GHz Max. Turbo Frequency (3.5 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4690S Processor
Up to 3.9 GHz Max. Turbo Frequency (3.2 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4590 Processor
Up to 3.7 GHz Max. Turbo Frequency (3.3 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Standard Features and Configurable Components

Intel® Core™ i5-4590S Processor
Up to 3.7 GHz Max. Turbo Frequency (3.0 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4570 Processor
Up to 3.6 GHz Max. Turbo Frequency (3.2 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4570S Processor
Up to 3.6 GHz Max. Turbo Frequency (2.9 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4670 Processor
Up to 3.8 GHz Max. Turbo Frequency (3.4 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4670S Processor
Up to 3.8 GHz Max. Turbo Frequency (3.1 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4430 Processor
Up to 3.2 GHz Max. Turbo Frequency (3.0 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i5-4430s Processor
Up to 3.2 GHz Max. Turbo Frequency (2.7 GHz base frequency)
6 MB cache, 4 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® 4th Generation Core™ i3 Processors

Intel® Core™ i3-4360 Processor
Up to 3.7 GHz Base Frequency
4 MB cache, 2 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Standard Features and Configurable Components

Intel® Core™ i3-4350 Processor
Up to 3.6 GHz Base Frequency
4 MB cache, 2 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i3-4150 Processor
Up to 3.5 GHz Base Frequency
3 MB cache, 2 cores, 4 threads
Intel HD Graphics 4400
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i3-4340 Processor
Up to 3.6 GHz base frequency
4 MB cache, 2 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i3-4330 Processor
Up to 3.5 GHz base frequency
4 MB cache, 2 cores, 4 threads
Intel HD Graphics 4600
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Core™ i3-4130 Processor
Up to 3.4 GHz base frequency
3 MB cache, 2 cores, 4 threads
Intel HD Graphics 4400
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Pentium Processors

Intel® Pentium G3450 Processor
Up to 3.4 GHz Base Frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Pentium G3440 Processor
Up to 3.3 GHz Base Frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Pentium G3240 Processor
Up to 3.1 GHz Base Frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1600 MT/s data rate

Standard Features and Configurable Components

Intel® Pentium G3430 Processor
Up to 3.3 GHz base frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Pentium G3420 Processor
Up to 3.2 GHz base frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Pentium G3220 Processor
Up to 3.0 GHz base frequency
3 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1600 MT/s data rate

Intel® Celeron Processors

Intel® Celeron™ G1850 Processor
2.9 GHz base frequency
2 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1333 MT/s data rate

Intel® Celeron™ G1840 Processor
2.8 GHz base frequency
2 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1333 MT/s data rate

Intel® Celeron™ G1830 Processor
2.8 GHz base frequency
2 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1333 MT/s data rate

Intel® Celeron™ G1820 Processor
2.7 GHz base frequency
2 MB cache, 2 cores, 2 threads
Intel HD Graphics
Supports DDR3 memory up to 1333 MT/s data rate

*Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

CHIPSET

Intel® 9 Series (H97 Express) Chipset

Standard Features and Configurable Components

GRAPHICS

Intel HD Graphics on all models (integrated on processor)

AMD Radeon HD 8350 (1GB) FH PCIe x16*
AMD Radeon HD 8350 (1GB) PCIe x16 DH
AMD Radeon HD 8470 (2GB) FH *
AMD Radeon HD 8490 DP (1GB) PCIe x16
NVIDIA GeForce GT630 DP (2GB) PCIe x16
NVIDIA NVS 310 512MB 1st
NVIDIA NVS 315 1GB PCIe x16
AMD Radeon R7 240 2GB FH PCIe x16*
AMD Radeon R9 255 2GB PCIe x16**

*Available only in China region

**Projected availability, October 2014
Discrete graphics options cannot be configured with 180W power supply and Quad-Core Processor

ADAPTERS AND CABLES

HP DMS-59 to Dual DisplayPort Cable
HP DMS-59 to Dual DVI Cable
HP DMS-59 to Dual VGA Cable
HP DisplayPort to DisplayPort Cable
HP DisplayPort to DVI-D Adapter
HP DisplayPort to HDMI Adapter
HP DisplayPort to VGA Adapter
HP Serial Port Adapter
HP Parallel Port Adapter
HP DisplayPort Cable

STORAGE*

SATA Drives

2 TB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5”
2 TB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5” - 2nd hard drive
1 TB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5”
1 TB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5” - 2nd hard drive
500 GB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5”
500 GB, 7200 RPM, SATA 6.0 Gb/s, SMART IV, 3.5” - 2nd hard drive
500GB, 7200 RPM SATA SED, 2.5” (with 3.5” adapter when installed in MT)
500GB, 7200 RPM SATA SED, 2.5” (with 3.5” adapter when installed in MT) - 2nd hard drive

Hybrid Drives

1 TB SATA 6G 2.5” (8 GB cache) SSHD Drive (with 3.5” adapter when installed in MT)
1 TB SATA 6G 2.5” (8 GB cache) SSHD Drive (with 3.5” adapter when installed in MT) - 2nd hard drive

Standard Features and Configurable Components

500 GB SATA 6G 2.5" (8GB cache) SSHD Drive (with 3.5" adapter when installed in MT)
500 GB SATA 6G 2.5" (8GB cache) SSHD Drive (with 3.5" adapter when installed in MT) - 2nd hard drive
500 GB SATA 6G 2.5" (8GB cache) SSHD Drive w/caddy
500 GB SATA 6G 2.5" (8GB cache) SSHD Drive w/caddy- 2nd hard drive

Solid State Drives

128 GB SATA 6G 2.5" SSD (with 3.5" adapter when installed in MT)
128 GB SATA 6G 2.5" SSD (with 3.5" adapter when installed in MT) - 2nd hard drive
128 GB SATA 6G 2.5" SSD w/caddy
128 GB SATA 6G 2.5" SSD w/caddy - 2nd hard drive

Self-encrypting Drives

500GB 7200 RPM SATA 2.5 SED HDD

Self-encrypting Solid State Drives

500GB 2.5" FIPS 140-2 Self-Encrypting (SED) Solid State Drive
500GB 2.5" FIPS 140-2 Self-Encrypting (SED) Solid State Drive - 2nd hard drive
500GB 2.5" FIPS 140-2 w/ca Self-Encrypting (SED) Solid State Drive
500GB 2.5" FIPS 140-2 w/ca Self-Encrypting (SED) Solid State Drive - 2nd hard drive
256GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive SSD
256GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive - 2nd hard drive
256GB SATA 2.5" w/ca Opal2 Self-Encrypting (SED) Solid State Drive
256GB SATA 2.5" w/ca Opal2 Self-Encrypting (SED) Solid State Drive - 2nd hard drive
256 GB SATA 2.5" Self-Encrypting (SED) Solid State Drive (with 3.5" adapter when installed in MT)
256 GB SATA 2.5" Self-Encrypting (SED) Solid State Drive (with 3.5" adapter when installed in MT) - 2nd hard drive
256 GB SATA 2.5" w/caddy Self-Encrypting (SED) Solid State Drive
256 GB SATA 2.5" w/caddy Self-Encrypting (SED) Solid State Drive - 2nd hard drive
180GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500)
180GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500) - 2nd hard drive
180GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500) w/caddy
180GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500) w/caddy - 2nd hard drive
128GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive
128GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive- 2nd hard drive
128GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive w/ caddy
128GB SATA 2.5" Opal2 Self-Encrypting (SED) Solid State Drive w/ caddy - 2nd hard drive
120GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500)
120GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500) - 2nd hard drive
120GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500) w/ caddy
120GB SATA 2.5" Opal1 Self-Encrypting (SED) Solid State Drive (Pro 1500) w/ caddy - 2nd hard drive

10K 6 Gb/s Hard Drives

1TB 10K RPM 6G 3.5" Hard Drive
1TB 10K RPM 6G 3.5" Hard Drive - 2nd hard drive
500GB 10K RPM 6G 3.5" Hard Drive

Standard Features and Configurable Components

500GB 10K RPM 6G 3.5 Hard Drive - 2nd hard drive

Frame/Carrier

HP Slim Removable SATA HDD Frame/Carrier

Optical Disc Drives

Slim DVD-ROM

Slim BDXL Blu-ray Writer

Slim SuperMulti

Media Card Reader**

SD Media Card Reader

*For hard drives and solid state drives, GB = 1 billion bytes. Actual formatted capacity is less. Up to 16 GB (for Windows 7) and 30 GB (for Windows 8.1) of system disk is reserved for the system recovery software.

**Card sold separately

MEMORY*

Form Factor	Type	Maximum	# of Slots
Microtower	DDR3 non-ECC Up to 1600 MT/s	32 GB	4 DIMM

* Full availability of 4 GB or more of memory requires a 64-bit operating system. With Windows 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.

Memory modules support data transfer rates up to 1600 MT/s; actual data rate is determined by the system's configured processor. See processor specifications for supported memory data rate.

PERFORMANCE

Intel® Smart Response Technology Disk Cache Modules

32GB SATA Solid State Disk Cache

NETWORKING/COMMUNICATIONS

Ethernet (RJ-45)

Realtek RTL8151GH-CG GbE LOM (standard)

Intel Ethernet I210-T1 PCIe x1 Gb Network Interface Card (optional)

Wireless*

Intel® Dual Band Wireless-N 7260 802.11 a/b/g/n PCI Express (optional)

HP WLAN 802.11 a/b/g/n 2x2 Dual Band PCIe x1 WLAN/Bluetooth Card (optional)

* Wireless access point and Internet service required and not included. Availability of public wireless access points limited.

Standard Features and Configurable Components

AUDIO/MULTIMEDIA

HD audio with Realtek ALC221 codec (all ports are stereo)
DTS Studio Sound audio management technology
Microphone and headphone front ports (3.5mm)
Line-out and Line-In rear Ports (3.5mm)
Multi-streaming capable
Internal speaker (standard)

KEYBOARDS AND POINTING DEVICES

Keyboard

HP PS/2 Keyboard
HP USB Keyboard
USB Smart Card (CCID) Keyboard
HP USB and PS/2 Washable Keyboard
HP Wireless Keyboard and Mouse Combo*
*Keyboard contains 25% post-consumer recycled plastic material

Mice

HP PS/2 Mouse
HP USB Mouse
HP USB 1000dpi Laser Mouse
HP USB and PS/2 Washable Mouse

HP BIOSphere

Standard Features and Configurable Components

Key features of the HP BIOS include:

- Deployment and manageability - HP BIOS provides several technologies that help integrate the HP ProDesk 490 G2 MT Business PC into the enterprise, such as PXE, and F10 Setup support for 12 languages.
- Support UEFI specification 2.3.1
- Thermal and power management - The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Business Desktop computer in any enterprise environment.
- Thermal Controlled Fans – Automatic or manual controlled fan speeds for cooling and acoustic performance Serviceability - HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery - HP BIOS provides numerous ways to upgrade HP Business Desktop computers, including BIOS updates from within DOS (DOSFlash), BIOS updates from within Windows (HPQFlash), HP Client Manager, and fail-safe recovery (Emergency Boot Block Recovery).
- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery.
- Serviceability - HP BIOS provides diagnostic and detailed service information.

Additional HP BIOS Features:

- Power-On password - Helps prevent an unauthorized user from powering on the system.
- Administrator password - Also known as the setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS version cannot be changed and changes cannot be made to BIOS settings using F10 setup or under the OS.
- Advanced Configuration and Power Interface (ACPI) - Represents a significant innovation in power and configuration management, allowing operating systems and applications to manage power based on activity and usage. HP Pro models use ACPI to provide power conservation features.
- S5 Max Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 1W is S5 (when turned off). When S5 Max Power Savings feature is enabled power to slots is turned off along with WOL functionality.
- HP BIOS Protection – prevents unauthorized updates or changes to the BIOS due to malware, viruses, or malicious BIOS updates. Based on NIST SP800-147 policy guidelines.

MANAGEABILITY

Standard Features and Configurable Components

Fully manageable and supported by industry-standard HP Client Management Solutions. Optional LANDesk management tools simplify mobile device management and security. Simplify everything from deployment or migration to daily management, security, licensing, and more—and stop downtime before it starts.

- Hardware Management: Inventory, Device config and BIOS updates, HW alerting, Driver updates
- Software Management: Deployment, App Management, Patch Management; Deployment and Migration; Proactive HW and SW Management; Mobile Users and Device Management; Remote Assistance / Help Desk
- LANDesk Management Suite 9.5 (LDMS) – optional – contact HP representative for part numbers
- Hardware integration with Microsoft System Center Configuration Manager: Client Integration Kit (CIK), Client Catalog, Client Driver Packs
- HP SoftPaq Download Manager (SDM)
- HP System Software Manager (SSM)
- HP BIOS Configuration Utility (BCU)
- HP Driver Packs
- HP Client Management Interface (HP CMI)
- Absolute Persistence Software*

*BIOS Absolute Persistence module is shipped turned off, and will be activated when customers purchase and activate a subscription. Service may be limited. Check with Absolute for availability outside the U.S. The optional subscription service of Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: http://www.absolute.com/company/legal/agreements/computrace-agreement. If Data Delete is utilized, the Recovery Guarantee payment is null and void. In order to use the Data Delete service, customers must first sign a Pre-Authorization Agreement and either create a PIN or purchase one or more RSA SecurID tokens from Absolute Software.

SECURITY

Trusted Platform Module (TPM) 1.2 (Common Criteria EAL4+ certified)	**X**
SATA port disablement (via BIOS)	**X**
Drivelock	**N/A**
RAID configurations	**X**
Intel® Identify Protection Technology (IPT)*	**N/A**
Serial, parallel, USB enable/disable (via BIOS)	**X**
Optional USB Port Disable at factory (user configurable via BIOS)	**X**
Removable media write/boot control	**X**
Power-On password (via BIOS)	**X**
Administrator password (via BIOS)	**X**
HP Chassis (1 bay) Security Kit	**N/A**
Solenoid Hood Lock / Sensor	**N/A**
Support for chassis padlocks and cable lock devices	**X**

*Models configured with Intel Core processors have the ability to utilize advanced security protection for online transactions. IPT, used in conjunction with participating web sites, provides double identity authentication by adding a hardware component in addition to the usual user name and password. IPT is initialized through an HP Client Security module.

ENVIRONMENTAL & REGULATORY

ENERGY STAR® qualified models available

Standard Features and Configurable Components

EPEAT® registered where applicable/supported. EPEAT registration varies by country. See www.epeat.net for registration status by country.

Low halogen (chassis, all internal components and modules)*

TAA compliant

For accessibility information on HP products, please visit: http://www.hp.com/accessibility.

*External power supplies, power cords, cables and peripherals are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.

PORTS

I/O Ports – Standard

USB 2.0	4 (rear)
USB 3.0	2 (front); 2 (rear)
Serial (RS-232)	1
PS/2	1 keyboard (purple), 1 mouse (green)
Video	1 VGA, 1 DVI-D

NOTE: When configured with an Intel Celeron, Pentium or 4th generation Intel Core i3 CPU only two of the available video output ports are active.

Audio	Front: headphone/mic Rear: line in/out 3.5mm diameter
RJ-45 Network Interface	1

I/O Ports – Optional

2nd Serial (RS-232)	1
Parallel	1
PCI Express x1 (v2.0)	3 4.2” full height 6.6” length 10W max. power
PCI Express x16 (v2.0)	1 4.2” full height 6.6” length 75W max. power

BAYS

(4 total – 2 external, 2 internal)

External, SD reader	1
External, Slimline ODD	1
Internal 3.5” storage drive*	2

*One bay can be configured as a 2.5”

SERVICE AND SUPPORT

On-site Warranty [1]: One-year (1-1-1) limited warranty delivers one year of on-site, next business day [2] service for parts and

Standard Features and Configurable Components

labor and includes free telephone support [3] 24 x 7. One-year onsite and labor are not available in all countries. Service offers terms up to 5 years by choosing a Care Pack. To choose the right level of service for your HP product, visit HP Care Pack Central: www.hp.com/go/cpc

NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply. Other warranty variations may be offered in your region.

NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.

NOTE 3: Technical telephone support applies only to HP-configured and third-party HP qualified hardware and software. Toll-free calling and 24 x 7 support may not be available in some countries.

Technical Specifications – Operating Systems and Software

OPERATING SYSTEMS

Preinstalled

Windows 8.1 Pro (64-bit)*
Windows 8.1 (64-bit)*
Windows 7 Ultimate (32-bit)**
Windows 7 Ultimate (64-bit)**
Windows 7 Professional (32-bit)**
Windows 7 Professional (64-bit)**
Windows 7 Professional (32-bit) (available through downgrade rights from Windows 8.1 Pro)***
Windows 7 Professional (64-bit) (available through downgrade rights from Windows 8.1 Pro)***
Windows 7 Home Premium (32-bit)**
Windows 7 Home Premium (64-bit)**
Windows 7 Home Basic (32-bit)**
FreeDOS 2.0

For all Preinstalled operating systems HP provides Microsoft WHQL certified (where applicable) drivers on www.hp.com at the time of product announcement.

Web Support Windows 7 Enterprise (32-bit or 64-bit)

For all Supported operating systems HP performs testing of the OS, and makes available all HP value add software (OS dependent). Certified drivers are made available on www.hp.com within 30 days of product announcement.

*Not all features are available in all editions of Windows 8.1. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8.1 functionality. See http://www.microsoft.com.

**Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

***This system is preinstalled with Windows® 7 Professional software and also comes with a license and media for Windows 8.1 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.

SOFTWARE COMPONENTS AND APPLICATIONS WITH WINDOWS

Included	Windows 7	Windows 8.1
Security	HP Client Security: HP Drive Encryption (FIPS 140-2)[1] HP Device Access Manager with Just In Time Authentication HP Password Manager HP File Sanitizer (SSDs and Hybrid Drives not supported)[5] HP Disk Sanitizer External Edition[2,4] Microsoft Security Essentials (Windows 7)	Disk Sanitizer External Edition[2, 4] Microsoft Defender[7]
MultiMedia	Cyberlink Power DVD, BD Cyberlink Power2Go (Secure Burn)	Cyberlink Power DVD, BD Cyberlink Power2Go (Secure Burn)
Communication		HP Wireless Hotspot[8]
HP Value Add	HP ePrint Driver[3] HP PageLift HP Recovery Manager HP Support Assistant HP Recovery Disk Creator	HP ePrint Driver[3] HP PageLift HP Recovery Manager HP Support Assistant

Technical Specifications – Operating Systems and Software

3rd Party	Box 50 GB Offer[6] Foxit PhantomPDF Express Skype	Box Application Foxit PhantomPDF Express Skype
Microsoft Products	Buy Office	Buy Office

1. Drive Encryption requires Windows. Data is protected prior to Drive Encryption login. Turning the PC off or into hibernate logs out of Drive Encryption and prevents data access.
2. Available via download
3. Requires an Internet connection to HP web-enabled printer and HP ePrint account registration (for a list of eligible printers, supported documents and image types and other HP ePrint details, see www.hp.com/go/eprintcenter).Requires optional broadband module. Broadband use requires separately purchased service contract. Check with service provider for coverage and availability in your area. Separately purchased data plans or usage fees may apply. Print times and connection speeds may vary.
4. For the use cases outlined in the DOD 5220.22-M Supplement. Does not support Solid State Drives (SSDs). Requires Disk Sanitizer, External Edition for Business Desktops from hp.com.
5. For the use cases outlined in the DOD 5220.22-M Supplement. Does not support Solid State Drives (SSDs). Initial setup required. Web history deleted only in Internet Explorer and Firefox browsers and must be user enabled. With Windows 8.1, user must turn off Enhanced Protection Mode in IE11 for shred on browser close feature.
6. Requires Box registration. Offer available to new Box users only. Box App requires Windows 8 or 8.1. Offer subject to change without notice.
7. Requires Windows 8 and internet access.
8. The Wireless Hotspot application requires an active internet connection and separately purchased data plan. While HP Wireless Hotspot is active, on-device applications will continue to work and will use the same data plan as the wireless hotspot. Wireless Hotspot data usage may incur additional charges. Check with your plan for plan details. Requires Windows.

Technical Specifications - Graphics

GRAPHICS

Intel HD Graphics		
VGA Controller	Integrated	
DisplayPort	Multimode capable; supports HDCP, Display Port Audio (2 streams), HBR2 link rates and Multi-Stream Technology for a maximum of 2 displays (including the integrated panel)	
Bus Type	N/A	
RAMDAC	N/A	
Memory	Intel graphics do not have dedicated memory but utilizes some of the computer's system memory The amount of memory used for graphics depending on the amount of system memory installed, BIOS settings, operating system, and system load. 32 MB is pre-allocated for graphics use at system boot time. Additional memory can be allocated at boot time by the BIOS for PAVP (Protected Audio Video Playback) support for playback of protected video content. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (DVMT), to provide an optimal balance between graphics and system memory use.	
Maximum Graphics Memory	Microsoft Windows 7	Windows 8.1
	Up to 1.7GB	Up to 1.8GB
	Note: the actual amount of maximum graphics memory can be less than the amounts listed above depending upon your computer's configuration.	
Maximum Color Depth	32 bits/pixel	

Graphics/Video API Support	4th Generation Core processors:
	• The Processor Graphics contains a refresh of the seventh generation graphics core enabling substantial gains in performance and lower power consumption. Up to 16 EU support.
	• Next Generation Intel Clear Video Technology HD Support is a collection of video playback and enhancement features that improve the end user's viewing experience
	  ○ Encode/transcode HD content
	  ○ Playback of high definition content including Blu-ray Disc
	  ○ Superior image quality with sharper, more colorful images
	• DirectX Video Acceleration (DXVA) support for accelerating video processing
	  ○ Full AVC/VC1/MPEG2 HW Decode
	• Advanced Scheduler 2.0, 1.0
	• Windows 7, Windows 8.1, Linux OS Support
	• DirectX 11.1
	• OpenGL 4.0
	• Open CL 1.2	

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	Refresh Rates
800x600	60 Hz
1024x768	60 Hz
1152x864	60 Hz

Technical Specifications - Graphics

1280x600	60 Hz
1280x720	60 Hz
1280x800	60 Hz
1280x960	60 Hz
1280x1024	60 Hz
1360x768	60 Hz
1366x768	60 Hz
1400x1050	60 Hz
1440x900	60 Hz
1600x900	60 Hz
1600x1200*	60 Hz
1680x1050	60 Hz
1920x1080	60 Hz
1920x1200*	60 Hz
1920x1440*	60 Hz
2560x1440*	60 Hz
2560x1600*	60 Hz

* Only supported on displays connected to the external DisplayPort connector.

AMD Radeon HD 8470 Graphics Card	
Form Factor	Full Height
Graphics Controller	AMD Radeon HD 8470
Core Clock	775MHz
Memory Clock	900MHz
Memory	2GB, DDR3, 64-bit wide
Bus Type	PCIe Gen2
Max. Power	< 30W
Power Source Support	12V and 3.3V
3D API Support	DX11
HDCP Support	Yes
Display Max. Resolution	Digital 2560 x 1600 Analog 2048 x 1536
Supported Graphics APIs	DX11, OpenGL, full 1080p BD (H264) playback in hardware, HDMI 1.4 support

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	**Refresh Rates**

Technical Specifications - Graphics

800 x 600	60 Hz
1024 x 768	60 Hz
1280 x 720	60 Hz
1280 x 768	60 Hz
1280 x 1024	60 Hz
1360 x 768	60 Hz
1440 x 900	60 Hz
1600 x 900	60 Hz
1680 x 1050	60 Hz
1920 x 1080	60 Hz

NVIDIA NVS 310 Graphics Card

Introduction	The NVIDIA® NVS™ 310 Graphics Card is a PCI Express low profile form factor graphics add-in card targeted as an active low cost graphics solution for the corporate business and enterprise markets.	
Performance and Features	The NVIDIA® NVS 310 Graphics Card offers 512 MB of ultrafast DDR3 memory and is capable of supporting up to 2 displays. DisplayPort connector supports multimode technology to support connection to DVI-D, VGA and HDMI monitors with optional adapters in kits NR078AA, FH973AT, BP937AA, AS615AA. For a DisplayPort to DisplayPort connections use the optional DisplayPort Cable Kit VN567AA.	
Form Factor	Low Profile: 2.713 × 6.15 in	
Graphics Controller	NVIDIA® NVS 310	
Memory Clock	875MHz	
Memory Size	512 MB DDR3	
Memory Bandwidth	14 GB/s	
Max. Power	19.5W	
Display Max. Resolution	Up to 2560 x 1600 (digital display) per display	
Display Output	Up to 2 displays in the following configurations	
	DisplayPort output:	• Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort Multi-Stream topology technology.

Technical Specifications - Graphics

	DVI-D output:	• Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors • Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors
	HDMI output:	• NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors
	VGA display output:	• Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	**Maximum Refresh Rates (Hz) by Connection**			
	DisplayPort to VGA	DisplayPort to DVI-D	DisplayPort to HDMI	DisplayPort
640 x 480	85	60	60	60
800 x 600	85	60	60	60
1024 x 768	85	60	60	60
1280 x 720	85	60	60	60
1280 x 1024	85	60	60	60
1440 x 900	75	60	60	60
1600 x 1200	60	60	60	60
1680 x 1050	60	60	60	60
1920 x 1080	60-R	60-R	60	60
1920 x 1200	60-R	60-R		60
1920 x 1440				60

Technical Specifications - Graphics

2048 x 1536				60
2560 x 1600				60

Technical Specifications - Graphics

NVIDIA NVS 315 1GB PCIe x 16 Graphics Card	
Introduction	Get efficient dual-display graphics performance in a PCI Express low-profile graphics card with the NVIDIA NVS 315 PCIe x16 1 GB Graphics Card, an ideal desktop graphics solution for professional business and commercial applications.
Performance and Features	The NVIDIA® NVS 315 Graphics Card offers 1 GB of ultrafast DDR3 memory and is capable of supporting up to 2 displays. DisplayPort connector supports multimode technology to support connection to DVI-D, VGA and HDMI monitors with optional adapters in kits NR078AA, FH973AT, BP937AA, AS615AA. For a DisplayPort to DisplayPort connections use the optional DisplayPort Cable Kit VN567AA.
Form Factor	Low Profile: 2.713 × 6.15 in
Graphics Controller	NVIDIA® NVS 315
Memory Clock	875MHz
Memory Size	512 MB DDR3
Memory Bandwidth	14 GB/s
Connectors	DMS-59 , with support for dual VGA, dual DVI or dual Display Port with the appropriate adapter cable
Display Max. Resolution	Up to 2048 x 1536 VGA; 1920 x 1200 DVI; 2560 x 1600 DisplayPort
Display Output	Up to 2 displays in the following configurations

	• Dual DVI :
	  ○ Drives two DVI displays using optional HP DMS59 DVI Dual-head Connector Cable DL139A
	• Dual DisplayPort :
	  ○ Drives two DisplayPort using optional HP DMS-59 to Dual DisplayPort kit XP688AA
	• Dual VGA :
	  ○ Drives two analog using the included HP DMS-59 to Dual VGA Cable

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	Maximum Refresh Rates (Hz) by Connection	
	Analog Connection	Digital Connection
640 x 480	85	60
720 x 480	85	60
720 x 576	85	60
800 x 600	85	60

Technical Specifications - Graphics

1024 x 768	85	60
1280 x 720	85	60
1280 x 768	85	60
1280 x 1024	85	60
1440 x 900	75	60
1600 x 1024	85	60
1600 x 1200	85	60
1680 x 1050	75	60
1920 x 1080	85	60-R
1920 x 1200	85	60-R
1920 x 1440	85	N/A
2048 x 1536	75	N/A
2560 x 1440	N/A	60*
2560 x 1600	N/A	60*
		* Display Port Only

NVIDIA GeForce GT630 Graphics Card	
Introduction	The NVIDIA GeForce GT630 DP (2GB) PCIe x16 Card Graphics Card provides a full height, PCI Express x16 graphics add-in card solution based on the NVIDIA Kepler Architecture GPU. The card is designed to support three display connections through its DVII, and two DisplayPort connectors. An ideal solution for desktop PC customers seeking enhanced 2D and advanced 3D graphics performance, the NVIDIA GeForce GT630 DP (2GB) PCIe x16 Cards are an excellent choice for business users who want run multiple displays from a single graphics board. Engage in Web conferencing or video or photo editing, while improving your everyday business PC experience with better graphics and excellent visual display quality.
Performance and Features	The NVIDIA GeForce GT630 DP (2GB) PCIe x16 Cards deliver superior PCI Express (PCIe) Gen 3 features including: • Unprecedented flexibility for new applications and enhanced performance • Support for NVIDIA surround technology • Run multiple displays from a single graphics card • Full 16 lane PCIe Generation 3 bus support with peak bandwidth support • Wireless Display ready for future support
Form Factor	PCIe x16 Card
Graphics Controller	NVIDIA Kepler Architecture GPU
Core Clock	875 MHz
Memory Clock	891 MHz
Memory Size	2 GB DDR3 128 bit
Memory Bandwidth	28.5 GB/s

Technical Specifications - Graphics

Display Max. Resolution	2560 x 1600 digital, 2048 x 1536 analog
Display Support	Integrated 400 MHz RAMDAC

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	**Maximum Refresh Rates (Hz)**	
	Analog Connection	Digital Connection
640 x 480	85	60
800 x 600	85	60
1024 x 768	85	60
1280 x 720	85	60
1280 x 1024	85	60
1440 x 900	75	60
1600 x 1200	85	60
1680 x 1050	75	60
1920 x 1080	85	60-R
1920 x 1200	85	60-R
1920 x 1440	85	60
2048 x 1536	75	60
2560 x 1600	N/A	60

AMD Radeon HD 8350 1GB PCIe x16 DH Graphics Card

Introduction	Get stable 2D and advanced 3D graphics performance from the AMD Radeon HD 8350 1 GB PCIe x16 DH Graphics Card, a low profile, PCI Express x16 graphics add-in card based on the AMD Radeon HD 8350 GPU, great for Web conferencing or video and photo editing.
Form Factor	PCie x16
Graphics Controller	AMD Radeon HD 8350
Core Clock	GPU engine operates at 523 MHz
Memory	1GB, DDR3, SDRAM
Memory Clock	875 MHz
HDCP Support	Yes
Display Max. Resolution	Digital 1920 x 1200 Analog 2048 x 1536

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

	Analog Connection	Digital Connection

Technical Specifications - Graphics

640 x 480	85	60
720 x 480	85	60
720 x 576	85	60
800 x 600	85	60
1024 x 768	85	60
1280 x 720	85	60
1280 x 768	85	60
1280 x 1024	85	60
1440 x 900	75	75
1600 x 1024	85	60
1600 x 1200	85	60
1680 x 1050	75	75-R
1920 x 1080	85	60-R
1920 x 1200	85	60-R
1920 x 1440	85	N/A
2048 x 1536	75	N/A
2560 x 1440	N/A	N/A
2560 x 1600	N/A	N/A

AMD Radeon HD 8490 1GB PCIe x16 Graphics Card	
Introduction	Get impressive graphics and high resolution dual-display performance in a low profile, PCI Express x16 graphics add-in card based on the AMD Radeon HD 8490 Graphics Processor. Improve your everyday PC, Web conferencing, and video or photo editing.
Form Factor	PCie x16
Graphics Controller	AMD Radeon HD 8490
Core Clock	GPU engine operates at 875 MHz
Memory	1GB, DDR3, SDRAM
Memory Clock	900 MHz
HDCP Support	Yes
Display Max. Resolution	Digital 2560 x 1600 Analog 2048 x 1536

Supported Display Resolutions and Refresh Rates

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

	Analog Connection	Digital Connection
300 x 200	85	60
320 x 240	85	60

Technical Specifications - Graphics

400 x 300	85	60
640 x 480	85	60
720 x 480	85	60
720 x 576	85	60
800 x 600	85	60
1024 x 768	85	60
1280 x 720	85	60
1280 x 768	85	60
1280 x 1024	85	60
1440 x 900	75	75
1600 x 900	85	60
1600 x 1024	85	60
1600 x 1200	85	60
1680 x 1050	75	75-R
1920 x 1080	85	60-R
1920 x 1200	85	60-R
1920 x 1440	85	N/A
2048 x 1536	75	N/A
2560 x 1440	N/A	60
2560 x 1600	N/A	60

AMD Radeon R7 240 2GB FH PCIe x16 GFX Graphics Card	
Form Factor	Full Height
Graphics Controller	AMD Radeon R7 240
Core Clock	730MHz
Memory Clock	1800MHz
Memory	2GB, DDR3
Frame Buffer	128-bit wide frame buffer
Bus Type	PCI Express 3.0 interface
Max. Power	32.71 W
Power Source Support	12V and 3.3V
HDCP Support	Yes, All digital outputs support HDCP (High-Bandwidth Digital Content Protection)
Display Max. Resolution	Digital 1920 x 1200 Analog 2048 x1536

Technical Specifications - Graphics

Compliance	Compliant with all listed and with all applicable ACPI, AGP Forum, ANSI, DDWG, HP, Intel, ITU, Microsoft, PCI SIG, SMPTE, and VESA APIs, standards, requirements, implementation guides, and ECRs.

SUPPORTED DVI-D (DIGITAL) AND DISPLAYPORT DISPLAY MODES

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	Refresh Rates
640 x 480	60 Hz
720 x 480	60 Hz
720 x 576	60 Hz
800 x 600	60 Hz
1024 x 768	60 Hz
1280 x 720	60 Hz
1280 x 768	60 Hz
1280 x 1024	60 Hz
1440 x 900	60 Hz, 75 Hz
1600 x 1024	60 Hz
1600 x 1200	60 Hz
1680 x 1050	75 Hz
1920 x 1080	60 Hz

AMD Radeon R9 255 2GB PCIe x16 GFX

Form Factor	PCie x16
Graphics Controller	AMD Radeon R9 255
Core Clock	900MHz
Memory Clock	1150MHz
Memory	2GB, (4 pcs of 4Gb 128Mx32 GDDR5)
Frame Buffer	128-bit wide frame buffer
Bus Type	PCI Express 3.0 interface
Max. Power	N/A
Power Source Support	12V and 3.3V
HDCP Support	Yes, All digital outputs support HDCP (High-Bandwidth Digital Content Protection)
Display Max. Resolution	Digital 1920 x 1200 Analog 2048 x1536

Technical Specifications - Graphics

Compliance	Compliant with all listed and with all applicable ACPI, AGP Forum, ANSI, DDWG, HP, Intel, ITU, Microsoft, PCI SIG, SMPTE, and VESA APIs, standards, requirements, implementation guides, and ECRs. Supports Microsoft DirectX 11.1, OpenGL 4.3 and OpenCL 1.2 APIs.

SUPPORTED DVI-D (DIGITAL) AND DISPLAYPORT DISPLAY MODES

Note: other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

Resolution	Refresh Rates
320 x 200	60 Hz
320 x 240	60 Hz
400 x 300	60 Hz
480 x 360	60 Hz
512 x 384	60 Hz
640 x 350	60 Hz
640 x 400	60 Hz
640 x 480	60 Hz
720 x 480	60 Hz
720 x 576	60 Hz
800 x 600	60 Hz
1024 x 768	60 Hz
1152 x 864	60 Hz
1280 x 720	60 Hz
1280 x 768	60 Hz
1280 x 960	60 Hz
1280 x 1024	60 Hz
1440 x 900	60 Hz, 75 Hz
1600 x 900	60 Hz
1600 x 1024	60 Hz
1600 x 1200	60 Hz
1680 x 1050	75 Hz
1680 x 1080	60 Hz
1920 x 1080	60 Hz
2560 x 1440	60 Hz
2560 x 1600	60 Hz

HARD DISK AND SOLID STATE STORAGE

Introduction:

HP Serial Advanced Technology Attachment (SATA) Hard Drives maximize the performance of HP Business PCs by providing the technologies to meet your increasing storage demands with high-capacity drives offering superior reliability and performance.

SATA provides faster data transfer speeds, better system cooling airflow, more bandwidth, more headroom for speed increases in future generations and better data integrity. A next-generation technology, the SATA interface connects hard drives to the PC platform enabling easy aggregation of multiple hard drives into a single PC. This offers you the additional benefits of dedicated bandwidth, the ability to more easily identify device failures and scalability. The HP ProDesk 490 G2 Series Business PC supports the latest SATA 6.0Gb/s specification.

SMART IV Technology

Self Monitoring Analysis and Reporting Technology (SMART) hard drive technology allows hard drives to monitor their own health and to raise flags if imminent failures are predicted. If the drive determines that a failure is imminent, the SMART hard drive technology enables the intelligent manageability or management software to generate a fault alert. While the current versions of SMART hard drives do a good job monitoring the data on the hard drive media, the ever increasing emphasis on reliability and quality has promoted HP to implement SMART IV technology which constantly checks that the data flow from host interface to media and media to host interface is not compromised. This is accomplished by inserting a 2 byte parity code into every 512 byte block in the data path of the hard drive's Cache RAM. This unique parity checking performed by HP's SMART IV technology hard drives, allows for more complete error detection coverage encompassing the entire data path between the host and the hard drive.

Smart IV is also known as IOEDC: I/O Error Detection Code.

Native Command Queuing

NCQ or Native Command Queuing is a SATA protocol extension that allows the hard drive to have several write or read commands outstanding at the same time. In contrast, normal non-queued operation requires each command to be completed before the next command is issued by the host system. Queuing allows the drive to complete the commands in the order that allows for best overall throughput. It also involves an advanced method of transferring data to or from the host, called First Party Direct Memory Access (FPDMA), which allows the hard drive and the host controller to manage the data transfers for multiple outstanding commands, without involving the host processor. NCQ can contribute to better performance but the results are dependent on many factors, including the access patterns of the various applications and operating system functions that are initiating drive accesses. Enabling NCQ features in the hard drive requires AHCI support from the host system BIOS, controller, and driver. AHCI support is typically implemented in RAID configurations.

Note: GB = 1 billion bytes. Actual available capacity is less.

Introduction:

HP Serial Advanced Technology Attachment (SATA) Hard Drives maximize the performance of HP Business PCs by providing the technologies to meet your increasing storage demands with high-capacity drives offering superior reliability and performance.

SATA provides faster data transfer speeds, better system cooling airflow, more bandwidth, more headroom for speed increases in future generations and better data integrity. A next-generation technology, the SATA interface connects hard drives to the PC platform enabling easy aggregation of multiple hard drives into a single PC. This offers you the additional benefits of dedicated bandwidth, the ability to more easily identify device failures and scalability. The HP ProDesk 490 G2 Series Business PC supports the latest SATA 6.0Gb/s specification.

SMART IV Technology

Technical Specifications – Hard Disk and Solid State Storage

Self Monitoring Analysis and Reporting Technology (SMART) hard drive technology allows hard drives to monitor their own health and to raise flags if imminent failures are predicted. If the drive determines that a failure is imminent, the SMART hard drive technology enables the intelligent manageability or management software to generate a fault alert. While the current versions of SMART hard drives do a good job monitoring the data on the hard drive media, the ever increasing emphasis on reliability and quality has promoted HP to implement SMART IV technology which constantly checks that the data flow from host interface to media and media to host interface is not compromised. This is accomplished by inserting a 2 byte parity code into every 512 byte block in the data path of the hard drive's Cache RAM. This unique parity checking performed by HP's SMART IV technology hard drives, allows for more complete error detection coverage encompassing the entire data path between the host and the hard drive.

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NCQ or Native Command Queuing is a SATA protocol extension that allows the hard drive to have several write or read commands outstanding at the same time. In contrast, normal non-queued operation requires each command to be completed before the next command is issued by the host system. Queuing allows the drive to complete the commands in the order that allows for best overall throughput. It also involves an advanced method of transferring data to or from the host, called First Party Direct Memory Access (FPDMA), which allows the hard drive and the host controller to manage the data transfers for multiple outstanding commands, without involving the host processor. NCQ can contribute to better performance but the results are dependent on many factors, including the access patterns of the various applications and operating system functions that are initiating drive accesses. Enabling NCQ features in the hard drive requires AHCI support from the host system BIOS, controller, and driver. AHCI support is typically implemented in RAID configurations.

Note: GB = 1 billion bytes. Actual available capacity is less.

2TB 7.2K rpm SATA 6.0Gb/s 3.5" Hard Disk Drive		
Unformatted Capacity	2 TB	
Rotational Speed	7,200 rpm	
Interface	SATA 6 Gb/s	
Cache, Multisegmented (MB)	64 MB	
Seek Time (average)	Read	<8.5 ms
	Write	<9.5 ms
Height	1.028 in/26.11 mm	
Width	4.0 in/101.6 mm	
Depth	5.787 in/146.99 mm	
Weight	1.38 lb/626 g	
Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications – Hard Disk and Solid State Storage

1TB 7.2K rpm SATA 6.0Gb/s 3.5” Hard Disk Drive		
Capacity	1,000,204,886,016 bytes	
Rotational Speed	7,200 rpm	
Interface	Serial ATA 3.0 (6.0 Gb/s)	
Buffer Size	32 MB	
Logical Blocks	1,953,525,168	
Seek Time (typical reads, includes controller overhead, including settling)	Single Track:	2.0 ms
	Average:	11 ms
	Full-Stroke:	21 ms
Height (nominal)	1 in/2.54 cm	
Width (nominal)	Media diameter: 3.5 in/8.89 cm	
	Physical size: 4 in/10.2 cm	
Operating Temperature	41° to 131° F (5° to 55° C)	

500GB 7.2K rpm SATA 6.0Gb/s 3.5” Hard Disk Drive		
Capacity	500,107,862,016 bytes	
Rotational Speed	7,200 rpm	
Interface	Serial ATA 3.0 (6.0 Gb/s)	
Buffer Size	16 MB	
Logical Blocks	976,773,168	
Seek Time (typical reads, includes controller overhead, including settling)	**Single Track:**	2.0 ms
	Average:	11 ms
	Full-Stroke:	21 ms
Height (nominal)	1 in/2.54 cm	
Width (nominal)	Media diameter: 3.5 in/8.89 cm	
	Physical size: 4 in/10.2 cm	
Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications – Hard Disk and Solid State Storage

500GB 7200 RPM SATA 2.5” Self-Encrypting (SED) Hard Disk Drive		
Capacity	500,107,862,016 bytes	
Rotational Speed	7,200 rpm	
Drive Type	Self-Encrypting Drive (SED) with SATA interface	
Interface	SATA 6 Gb/s	
Segmented Buffer with write cache	32768 KB - A portion of buffer capacity used for firmware	
Number of Sectors	976,773,168	
Seek Time (typical reads)	Single Track:	1.0 ms
	Average:	13 ms
	Full-Stroke:	25 ms
Media Diameter	2.5 in/63.5 mm	
Height	0.267 in/6.8 mm, ±0.2mm	
Width	2.75 in/69.85 mm, ±0.25mm	
Length	3.945 in/100.2 mm, ±0.25mm	
Weight	3.35 oz/95 g (max)	
Operating Temperature	41° to 131° F (5° to 55° C)	

1TB SATA 6G 2.5” 8GB Solid State Hybrid Drive (SSHD)	
Formatted Capacity	1 TB
Spindle Speed	5,400 rpm +/- 0.2%
Drive Type	Solid State Hybrid Drive (SSHD) technology with NAND Flash
Interface	Serial ATA (SATA)
Cache Buffer	64 MB
NAND Flash Commercial Multilevel Cell (cMLC)	8 GB

Technical Specifications – Hard Disk and Solid State Storage

Number of Sectors	976,773,168	
Seek Time (typical reads)	Single Track:	2.0 ms
	Average:	12 ms
Height	0.374 +/-.008 in (9.5 +/- 0.2 mm)	
Width	2.750 +/- 0.010 in (69.85 +/- 0.25 mm)	
Length	3.951 +0.008 / -0.010 in (100.35 +0.20 / -0.25 mm)	
Weight	0.254 lb/115 g (max)	
Operating Temperature	41° to 131° F (5° to 55° C)	

500 GB SATA 6G 2.5" 8GB Solid State Hybrid Drive (SSHD)

Formatted Capacity	500 GB	
Spindle Speed	5,400 rpm +/- 0.2%	
Drive Type	Solid State Hybrid Drive (SSHD) technology with NAND Flash	
Interface	Serial ATA (SATA)	
Cache Buffer	64 MB	
NAND Flash Commercial Multilevel Cell (cMLC)	8 GB	
Number of Sectors	976,773,168	
Seek Time (typical reads)	Single Track:	2.0 ms
	Average:	12 ms
Height	0.268 +/-.008 in (6.8 +/- 0.2 mm)	
Width	2.750 +/- 0.010 in (69.85 +/- 0.25 mm)	
Length	3.951 +0.008 / -0.010 in (100.35 +0.20 / -0.25 mm)	
Weight	0.209 lb/95 g (max)	
Operating Temperature	41° to 131° F (5° to 55° C)	

128 GB Solid State Drive

Unformatted Capacity	128 GB*

Technical Specifications – Hard Disk and Solid State Storage

Architecture	Multi Level Cell (MLC) NAND	
Interface	SATA 6 GB/sec	
Dimensions (W x H x D)	2.75 x 0.276 x 3.96 in (6.985 x 0.7 x 10.05 cm)	
Weight	0.16 lb (73 g)	
Bandwidth Performance	Sustained Sequential Read:	Up to 450 MB/ss
	Sustained Sequential Write:	Up to 260 MB/s
	Random Read (4KB):	up to 46K IOPs
	Random Write (4KB):	up to 56K IOPs
Latency	Read:	55ms (TYP)
	Write:	55ms (TYP)
Power	DC power requirement:	Min 4.5 V; Max 5.5 V
	Total power consumption:	160 mW (Active) ; <85 mW; (Idle)
Useful Drive Life	1.2 million device hours**	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity (operating):	5% to 95%
	Shock:	1,500 G/1.0 msec
Regulations	UL, CSA, EN 60950-2000, CISPR Pub 22 Class B, CNS 13438, AS/NZS CISPR 22:2002 Class B, Korea KCC, CE Mark	

* For solid state disk drives, GB means 1 billion bytes. 128GB is the unformatted capacity of this drive before a portion of the drive is reserved for flash management features. Actual capacity will vary by content
** The product achieves a mean time between failure (MTBF) based on population statistics not relevant to individual units.

500GB 2.5” FIPS 140-2 SED Solid State Drive

Formatted Capacity	500 GB
Architecture	Self-Encrypting (SED) Solid State Drive with SATA interface.
Interface	Serial ATA (6.0 Gb/s)
Form Factor	2.5 inch
Height	6.80 mm ± 0.20
Width	69.85 mm ± 0.25

Technical Specifications – Hard Disk and Solid State Storage

Length	100.35 mm ± 0.25/0.20		
Weight (typical)	<95 g (0.209 lb)		
Bandwidth Performance	Sustained data transfer rate OD	100 MB/s max	
	I/O data-transfer rate	600 MB/s max	
Power	Power consumption:	Spinup (max): 1.00A Idle, active: 0.70W Sleep 0.18W	
Environmental (all conditions, non-condensing)	Operating Temperature:		32° to 140° F (0° to 60° C)
	Relative Humidity:		5% to 95%
	Shock:		Maximum 400 G/2 ms
256GB SATA 2.5" Opal2 SED Solid State Drive			
Unformatted Capacity	256 GB 500,118,192 (User Addressable Sectors)		
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Trusted Computing Group(TCG) OPAL compliant encrypted solid state drive		
Interface	Serial ATA (6.0 Gb/s)		
Form Factor	2.5 inch		
Height	6.80 mm ± 0.20		
Width	69.85 mm ± 0.25		
Length	100.20 mm ± 0.25		
Weight	Up to 55 g		
Bandwidth Performance	Sustained Sequential Read:	Up to 520 MB/s	
	Sustained Sequential Write:	Up to 500 MB/s	
Power	Power consumption:	Active: 0.78A / 3.891W; Idle: 0.005A / 0.026W	

Technical Specifications – Hard Disk and Solid State Storage

Mean Time Between Failure (MTBF)	1,500,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

256 GB SATA 2.5" Self-Encrypting (SED) Solid State Drive

Unformatted Capacity	256,186,271 user addressable sectors	
Architecture	Self-Encrypting (SED) Solid State Drive with 25nm MLC NAND Flash and SATA interface	
Interface	Serial ATA 2.0 (3.0 Gb/s)	
NAND Flash	25nm MLC NAND Flash	
Height	.275 in/7mm	
Width	2.75 in/69.85 mm	
Length	3.95 in/100.5 mm	
Weight	0.161 lb (73 g)	
Bandwidth Performance	Sustained Sequential 128k Read:	Up to 450 MB/s
	Sustained Sequential 128k Write:	Up to 260 MB/s
	Random 4k Read:	Up to 46K IOPs
	Random 4k Write:	Up to 56K IOPs
Latency	Read:	55 µs
	Write:	55 µs
Power	SATA power consumption:	160 mW (active average); <85 mW (idle average)
Useful Drive Life	72TB written, up to 40GB/day for 5 years	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/1 ms

180GB SATA 2.5" Opal1 SED Solid State Drive (Pro 1500)

Technical Specifications – Hard Disk and Solid State Storage

Unformatted Capacity	351,651,888 Unformatted Capacity (Total User Addressable Sectors in LBA mode)	
Architecture	Self-Encrypting (SED) Solid State Drive with 20nm MLC NAND Flash and SATA interface	
Interface	Serial ATA (6.0 Gb/s)	
NAND Flash	20nm MLC NAND Flash	
Form Factor	2.5 inch	
Thickness	7 mm	
Weight	Up to 78 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 490 MB/s
	Random 4k Read:	Up to 41K IOPs
	Random 4k Write:	Up to 80K IOPs
Power	SATA power consumption:	195 mW (active average); 125 mW (idle average)
Mean Time Between Failure (MTBF)	1,200,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

128GB SATA 2.5” Opal2 SED Solid State Drive

Unformatted Capacity	128 GB 250,069,680 (User Addressable Sectors)
Architecture	Self-Encrypting (SED) Solid State Drive with NAND Flash and SATA interface. Trusted Computing Group(TCG) OPAL compliant encrypted solid state drive
Interface	Serial ATA (6.0 Gb/s)
Form Factor	2.5 inch

Technical Specifications – Hard Disk and Solid State Storage

Height	6.80 mm ± 0.20	
Width	69.85 mm ± 0.25	
Length	100.20 mm ± 0.25	
Weight	Up to 55 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 520 MB/s
	Sustained Sequential Write:	Up to 340 MB/s
Power	Power consumption:	Active: 0.78A / 3.891W; Idle: 0.005A / 0.026W
Mean Time Between Failure (MTBF)	1,500,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

120GB SATA 2.5" Opal1 SED Solid State Drive

Unformatted Capacity	234,442,648 Unformatted Capacity (Total User Addressable Sectors in LBA mode)	
Architecture	Self-Encrypting (SED) Solid State Drive with 20nm MLC NAND Flash and SATA interface	
Interface	Serial ATA (6.0 Gb/s)	
NAND Flash	20nm MLC NAND Flash	
Form Factor	2.5 inch	
Thickness	7 mm	
Weight	Up to 78 g	
Bandwidth Performance	Sustained Sequential Read:	Up to 540 MB/s
	Sustained Sequential Write:	Up to 480 MB/s
	Random 4k Read:	Up to 41K IOPs

Technical Specifications – Hard Disk and Solid State Storage

	Random 4k Write:	Up to 80K IOPs
Power	SATA power consumption:	195 mW (active average); 125 mW (idle average)
Mean Time Between Failure (MTBF)	1,200,000 hours	
Environmental (all conditions, non-condensing)	Operating Temperature:	32° to 158° F (0° to 70° C)
	Relative Humidity:	5% to 95%
	Shock:	1,500 G/0.5 ms

1TB 10K SATA 6.0Gb/s 3.5" Hard Disk Drive		
Capacity	500,107,862,016 bytes	
Rotational Speed	7,200 rpm	
Interface	Serial ATA 2.0 (6.0 Gb/s)	
Buffer Size	16 MB	
Logical Blocks	976,773,168	
Seek Time (typical reads, includes controller overhead, including settling)	Single Track:	2.0 ms
	Average:	12 ms
	Full-Stroke:	25 ms
Height (nominal)	0.374 in/9.5 mm	
Width (nominal)	Media diameter: 2.5 in/63.5 mm	
	Physical size: 2.75 in/70 mm	
Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications - Removable Storage

REMOVABLE STORAGE

HP Slim SuperMulti DVD Writer Drive		
Height	12.7mm height	
Orientation	Either horizontal or vertical	
Interface type	SATA/ATAPI	
Disc recording capacity	Up to 8.5 GB DL or 4.7 GB standard	
Dimensions (W x H x D)	5.04 x 0.5 x 5.0 in (128 x 12.7 x 127 mm) without bezel	
Weight (max)	0.42 lb (190 g)	
Write speeds	DVD-RAM	Up to 5X
	DVD-R DL	Up to 6X
	DVD+R	Up to 8X
	DVD+RW	Up to 8X
	DVD+R DL	Up to 6X
	DVD-R	Up to 8X
	DVD-RW	Up to 6X
	CD-R	Up to 24X
	CD-RW	Up to 24X
Read speeds	DVD-RAM	Up to 5X
	DVD-RW, DVD+RW	Up to 8X
	DVD-R DL, DVD+R DL	Up to 8X
	DVD+R, DVD-R	Up to 8X
	DVD-ROM DL, DVD-ROM	Up to 8X
	CD-ROM, CD-R	Up to 24X
	CD-RW	Up to 24X
Access time (typical reads, including settling)	Random	DVD-ROM: 170 ms (typical), CD-ROM: 170 ms (typical)
	Full Stroke	DVD-ROM: 320 ms (typical), CD-ROM: 320 ms (typical)
	Stop Time	6 seconds (typical)
Power	Source	Slimline SATA DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC (< 1000 mA typical, 1600 mA maximum)
	Temperature	41° to 122° F (5° to 50° C)

Technical Specifications - Removable Storage

Environmental conditions (operating - non-condensing)	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)

HP Slim Blu-ray BDXL Drive			
Height	12.7mm height		
Orientation	Either horizontal or vertical		
Interface type	SATA/ATAPI		
Disc recording capacity	Up to 128 GB QL, 100 GB TL, 50 GB DL or 25 GB standard SL		
Dimensions (W x H x D)	5.04 x 0.5 x 5.0 in (128 x 12.7 x 127 mm) without bezel		
Weight (max)	Up to 0.37 lb (170 g) without bezel		
		Triple-layer	**Quadruple-layer**
Write speeds	BD-R	Up to 4X	Up to 4X
	BD-RE	Up to 2X	Not supported
		Single-layer	**Double-layer**
	BD-R	Up to 6X	Up to 6X
	BD-RE	Up to 2X	Up to 2X
	DVD-R	Up to 8X	Up to 6X
	DVD-RW	Up to 6X	Not supported
	DVD+R	Up to 8X	Up to 6X
	DVD+RW	Up to 8X	Not supported
	DVD-RAM	Up to 5X	
	CD-R	Up to 24X	
	CD-RW	Up to 24X	
		Triple-layer	**Quadruple-layer**
	BD-R	Up to 4X	Up to 4X
	BD-RE	Up to 4X	Not supported
		Single-layer	**Double-layer**
	BD-ROM	Up to 6X	Up to 6X
	BD-R	Up to 6X	Up to 6X
Read speeds	BD-RE	Up to 6X	Up to 6X
	DVD-ROM	Up to 8X	Up to 8X
	DVD-R	Up to 8X	Up to 8X
	DVD-RW	Up to 8X	

Technical Specifications - Removable Storage

	DVD+R	Up to 8X	Up to 8X
	DVD+RW	Up to 8X	
	BDMV (AACS Compliant Disc)	Up to 6X/2X (Read/Play)	
	DVD-RAM	Up to 5X	
	DVD-Video (CSS Compliant Disc)	Up to 8X/4X (Read/Play)	
	CD-R/RW/ROM	Up to24X	
	CD-DA(DAE)	Up to 20X/10X (Read/Play)	
Access time (typical reads, including settling)	Random	BD-ROM: 205 ms (typical), DVD-ROM: 185 ms (typical), CD-ROM: 165 ms (typical)	
	Full Stroke	BD-ROM: 350 ms (typical), DVD-ROM: 345 ms (typical), CD-ROM: 340 ms (typical)	
Power	Source	Slimline SATA DC power receptacle	
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p	
	DC Current	5 VDC -1200 mA typical, 2000 mA maximum	
Environmental conditions (operating - non-condensing)	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 80%	
	Maximum Wet Bulb Temperature	84° F (29° C)	

HP Slim DVD-ROM Drive		
Height	12.7mm	
Orientation	Either horizontal or vertical	
Interface type	SATA/ATAPI	
Dimensions (W x H x D)	5.04 x 0.5 x 5.0 in (128 x 12.7 x 127 mm) without bezel	
Weight (max)	Up to 0.37 lb (170 g) without bezel	
Read speeds	DVD+R/-R/+RW/ -RW/+R DL /-R DL	Up to 8X
	DVD-ROM	Up to 8X
	CD-ROM, CD-R	Up to 24X
	CD-RW	Up to 24X
Access time (typical reads, including settling)	Random	DVD-ROM: 170 ms (typical), CD-ROM: 170 ms (typical)
	Full Stroke	DVD-ROM: 320 ms (typical), CD-ROM: 320 ms (typical)
Power	Source	Slimline SATA DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p

Technical Specifications - Removable Storage

	DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum
Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature (operating)	84° F (29° C)

Technical Specifications – Memory

MEMORY
System Memory Support

The HP ProDesk 490 G2 Business PC supports the 4th generation Intel® Core™ processor family. Based on a new PC micro-architecture, the processor is designed for a two-chip platform consisting of a processor and Platform Controller Hub (PCH). Unlike previous generations, the 4th generation Intel® Core™ processor includes an Integrated Memory Controller (IMC). The IMC supports DDR3/DDR3L protocols with two independent, 64-bit wide channels each accessing one or two DIMMs.

- Two channels of non-ECC DDR3/DDR3Lunbuffered dual in-line memory modules (UDIMM) or DDR3/DDR3L unbuffered small outline dual in-line memory modules (SO-DIMM) with a maximum of two DIMMs per channel
- Single-channel and dual-channel memory organization modes
- Data burst length of eight for all memory organization modes
- Memory data transfer rates of up to 1600 MT/s; actual supported data transfer rate determined by the configured processor.
- 64-bit wide channels
- DDR3/DDR3L system memory I/O voltage of 1.5V
- Theoretical maximum memory bandwidth of:
    - 21.3 GB/s in dual-channel mode assuming 1333 MT/s
    - 25.6 GB/s in dual-channel mode assuming 1600 MT/s

Platform Memory Support

- Microtower (MT) platforms support up to four (4) industry-standard DDR3-SDRAM DIMMs.

CAUTION: You must shut down the computer and disconnect the power cord before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged in to an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

NOTE: For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system.

Technical Specifications – Networking/Communication

NETWORKING/COMMUNICATION

Realtek RTL8151GH-CG GbE LOM Network Adapter		
Connector	RJ-45	
System Interface	Integrated on PCA	
Controller	Realtek RTL8151GH-CG Gigabit Ethernet Controller	
Memory	16 KB FIFO packet buffer memory	
Data rates supported	10/100/1000 Mbps	
IEEE Compliance	802.1P 802.1Q 802.3 802.3ab 802.3az 802.3u	
Bus architecture	PCI Express	
Data transfer mode	PCIe-based interface for active state operation (S0 state)	
Power requirement	Requires 3.3V and 1V or just 3.3V with integrated regulators Power consumption 0.425 W	
Network transfer mode	Full-duplex	
	Half-duplex (not supported for the 1000BASE-T transceiver)	
Network transfer rate	10BASE-T (half-duplex) 10 Mbps	
	10BASE-T (full-duplex) 20 Mbps	
	100BASE-TX (half-duplex) 100 Mbps	
	100BASE-TX (full-duplex) 200 Mbps	
	1000BASE-T (full-duplex) 2000 Mbps	
Environmental	Operating Temperature:	32° to 158° F (0° to 70° C)
	Operating Humidity:	60% RH
Management	WOL, auto MDI crossover, PXE, Muti-port teaming, Advanced cable diagnostic	

Intel® Ethernet I210-T1 Gigabit Network Adapter	
Connector	RJ-45
System Interface	PCI Express x1

Technical Specifications – Networking/Communication

Controller	Intel® I210 Gigabit Ethernet Controller	
Memory	Integrated Dual 48K configurable transmit receive FIFO Buffers	
Data rates supported	10/100/1000 Mbps	
IEEE Compliance	802.1P 802.1Q 802.2 802.3 802.3AB 802.3u 802.3x flow control	
Bus architecture	PCI-E 2.1	
Data path width	X1, 250 MB/s, Bi-directional interface	
Data transfer mode	Bus-master DMA	
Hardware certifications	FCC, B, CE, TUV-c, TUVus Mark Canada and United States, TUV-GS Mark for European Union	
Power requirement	Aux 3.3 V, 3.0 Watts in 1000 base-T and 1.0 Watts in 100 Base-T	
Boot ROM support	Yes 10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps	
Network transfer rate	10BASE-T (half-duplex) 10 Mbps	
	10BASE-T (full-duplex) 20 Mbps	
	100BASE-TX (half-duplex) 100 Mbps	
	100BASE-TX (full-duplex) 200 Mbps	
	1000BASE-T (full-duplex) 2000 Mbps (actual rate limited by PCI bus)	
Environmental	Operating Temperature:	32° to 132° F (0° to 55° C)
	Operating Humidity:	85% at 131° F (55° C)
Management	WOL, PXE, DMI, WFM 2.0	

Intel Dual Band Wireless-N 7260 802.11 a/b/g/n (2x2) Wireless Network Interface Connection

Wireless LAN Standards	IEEE 802.11a/b/g/n
Interoperability	Wi-Fi certified (802.11 a/b/g/n WMM, WPA, WPA2 and WPS)

Technical Specifications – Networking/Communication

	Cisco Compatible Extensions Program compliant with Microsoft Windows 7, Windows Vista and XP.	
	NOTE: WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.	
Frequency Band	802.11b/g/n	2.402-2.482 GHz
	802.11a/n	4.9 - 4.95 GHz (Japan) 5.15 - 5.25 GHz 5.25 - 5.35 GHz 5.47 - 5.725 GHz 5.825 - 5.850 GHz
Antenna Structure	2 transmit; 2 receive (2x2)	
Data Rates	802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: MCS 0 ~ MCS 15, (20MHz, and 40MHz)	
Modulation	Direct Sequence Spread Spectrum CCK, BPSK, QPSK, 16-QAM, 64-QAM	
Security	• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • IEEE 802.11i • Cisco Certified Extensions, all versions through CCX4 and CCX Lite • WAPI	
	Note: Check latest software/driver release for updates on supported security features.	
Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.	
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)	
Roaming	IEEE 802.11 compliant roaming between band Access Points	
Output Power	• 2.4G: +13.5dBm minimum • 5G: +12dBm minimum	
	Note: Maximum output power may vary by country according to local regulations.	
Power Consumption	Transmit: 2.0 Watts	
	Receive: 1.6 Watts	
	Idle mode: 250 mW (WLAN associated) In Power Save Polling mode and on battery power.	
	Idle mode: 100 mW (WLAN unassociated)	

Technical Specifications – Networking/Communication

	Radio off: 100 mW (WLAN unassociated)	
Power Management	ACPI compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity Note: Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).	802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps) 802.11b:-95 dBm (1 Mbps), -93 dBm (2 Mbps), -91 dBm (5.5 Mbps), -88 dBm (11 Mbps) 802.11g:-90 dBm (6 Mbps), -89 dBm (9 Mbps), -87 dBm (12 Mbps), -85 dBm (18 Mbps), -82 dBm (24 Mbps), -79 dBm (36 Mbps), -76 dBm (48 Mbps), -74 dBm (54 Mbps)	
Antenna Connections	2 U.FL type connectors (output impedance of 50 ± 2 ohms)	
Form Factors	PCI-Express Half-MiniCard	
Weight	0.0068 lb (3.1 g)	
Dimensions	0.12 x 1.06 x 1.18 in (3.1 x 26.8 x 30.0 mm)	
Operating Voltage	3.3V +/- 9%	
Temperature	**Operating:** **Non-operating:**	14° to 158° F (-10° to 70° C) -40° to 176° F (-40° to 80° C)
Humidity	**Operating:** **Non-operating:**	10% to 90% (non-condensing) 5% to 90% (non-condensing)
Altitude	**Operating:** **Non-operating:**	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Amber - Radio OFF; LED White - Radio ON	

HP WLAN 802.11 a/b/g/n 2x2 Dual Band PCIe x1 WLAN/Bluetooth Card

Wireless LAN Standards	IEEE 802.11a/b/g/n	
Interoperability	Wi-Fi certification	
	BQE certification of the Bluetooth component	
	CCXv1, v2, v3, v4, v5 CCX certified (Cisco Client Extensions)	
	NOTE: WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.	
Frequency Band	802.11b/g/n	2.402-2.482 GHz
	802.11a/n	4.9 - 4.95 GHz (Japan) 5.15 - 5.25 GHz 5.25 - 5.35 GHz 5.47 - 5.725 GHz 5.825 - 5.850 GHz

Technical Specifications – Networking/Communication

Antenna Structure	2 transmit; 2 receive (2x2) Two embedded dual band 2.4/5 GHz antennas are provided to the card to support WLAN MIMO communications and Bluetooth communications.
Data Rates	• 802.11b: 1, 2, 5.5, 11 Mbps • 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps • 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps • 802.11n: card will support rates for NSS=1 and NSS=2 for RX and TX for 20 and 40 MHz channels. Short and long guard interval shall be supported.
Security	• IEEE and WiFi compliant 64 / 128 bit WEP encryption for a/b/g mode only • AES-CCMP: 128 bit in hardware • 802.1x authentication • WPA, WPA2: 802.1x. WPA-PSK, WPA2-PSK, TKIP, and AES. • WPA2 certification • IEEE 802.11i • Cisco Certified Extensions, all versions through V5 • WAPI
	Note: Check latest software/driver release for updates on supported security features.
Roaming	IEEE 802.11 compliant roaming between band Access Points
Output Power	• +13.5 dBm minimum • Maximum output power must be able to achieve modular regulatory certification peak gain of +3dBi at 2.4GHz and +5dBi at 5GHz
	Note: Maximum output power may vary by country according to local regulations.
Power Consumption	Transmit: 2.0 Watts
	Receive: 1.6 Watts
	Idle mode: 250 mW (WLAN associated)
	Idle mode: 100 mW (WLAN unassociated)
	Radio off: 75 mW (WLAN unassociated)
Bluetooth Power Consumption	Peak operating: 330 mW
	Receive: 230 mW
	USB selective suspend: 17 mW
Power Management	ACPI and PCI Express bus compliant power management 802.11 compliant power saving mode Supports USB selective suspend and resume of the Bluetooth component through the USB control signals.
Receiver Sensitivity	802.11b

Sensitivity (dBm)	Rate (Mbps)	Modulation and Coding Rate
-95	1	BPSK
-93	2	QPSK

Technical Specifications – Networking/Communication

	<table><tr><td>-91</td><td>5.5</td><td>CCK</td></tr><tr><td>-88</td><td>11</td><td>CCK</td></tr></table>
	802.11a/g <table><tr><td>Sensitivity (dBm)</td><td>Rate (Mbps)</td><td>Modulation and Coding Rate</td></tr><tr><td>-90</td><td>6</td><td>BPSK - ½</td></tr><tr><td>-89</td><td>9</td><td>BPSK – ¾</td></tr><tr><td>-87</td><td>12</td><td>QPSK – ½</td></tr><tr><td>-85</td><td>18</td><td>QPSK – ¾</td></tr><tr><td>-82</td><td>24</td><td>16 QAM – ½</td></tr><tr><td>-79</td><td>36</td><td>16 QAM – ¾</td></tr><tr><td>-76</td><td>48</td><td>64 QAM – 2/3</td></tr><tr><td>-74</td><td>54</td><td>64 QAM – ¾</td></tr></table>
	802.11n <table><tr><td>Sensitivity (dBm)</td><td>Rate (Mbps)</td><td>Modulation and Coding Rate</td></tr><tr><td>-69</td><td>150</td><td>64 QAM – 5/6</td></tr><tr><td>-66</td><td>300</td><td>64 QAM – 5/6</td></tr></table>
Form Factors	PCI-Express Half-MiniCard
Weight	0.1133 oz (3.212 g)
Dimensions	1.04 x 1.17 x 0.042 in (26.65 x 29.85 x 1.067 mm)
Operating Voltage	3.3V +/- 9%
Temperature	**Operating:** 14° to 158° F (-10° to 70° C) **Non-operating:** -40° to 176° F (-40° to 80° C)
Humidity	**Operating:** 10% to 90% (non-condensing) **Non-operating:** 5% to 95% (non-condensing)
Altitude	**Operating:** 0 to 10,000 ft (3,048 m) **Non-operating:** 0 to 50,000 ft (15,240 m)

High Definition Audio

Type	Integrated
HD Stereo Codec	Realtek 2-channel ALC221 codec
Audio I/O Ports	Front microphone-In (150-K ohm Input Impedance)
	Rear Line-In/Microphone input (150-K ohm Input Impedance, function is configurable by audio driver)
	Rear Line-Out* (190 ohms Output Impedance, expects at least a 10-K ohm load)
	Front Headphone-Out (0.5 Ohm Output Impedance, expects at least a 32 ohm load) Front Microphone/Headphone jack is re-task able to provide Microphone input, line-in or Headphone output to support connecting two headphones to the front of the system. When

Technical Specifications - Audio

	configured as a second front headphone output, both front headphone outputs are always driven with the same signal.
	All ports are 3.5mm

AUDIO

Internal Speaker Amplifier	1.5W amplifier for the internal speaker only. External speakers must be powered externally.
Multi-streaming Capable	Multi-streaming can be enabled in the Realtek control panel to allow independent audio streams to be sent to/from the front and rear jacks.
Sampling	8 kHz - 192 kHz
Wavetable Syntheses	Yes – Uses OS soft wavetable
Analog Audio	Yes
# of Channels on Line-Out	Stereo (Left & Right channels)
Internal Speaker	Yes
External Speaker Jack	Yes

Technical Specifications - Input/Output Devices

INPUT/OUTPUT DEVICES

HP PS/2 Keyboard		
Physical Characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
	Dimensions (L x W x H)	18.22 x 6.47 x 1.1 in (46.28 x 16.43 x 2.79 cm)
	Weight	2 lb (0.9 kg) minimum
Electrical	Operating voltage	+ 5VDC ± 10%
	Power consumption	50-mA maximum (with three LEDs ON)
	System interface	PS/2 6-pin mini din connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC 99 - 2001	Functionally compliant
	Keycaps	Low-profile design
	Switch actuation	55-g nominal peak force with tactile feedback
	Switch life	20 million keystrokes (using Hasco modified tester)
	Switch type	Contamination-resistant switch membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	6 ft (1.8 m)
	Microsoft PC 99 - 2001	Mechanically compliant
Environmental	Acoustics	50-dBA maximum sound pressure level
	Operating temperature	32° to 104° F (0° to 40° C)
	Non-operating temperature	-22° to 149° F (-30° to 65° C)
	Operating humidity	15% to 80% (non-condensing at ambient)
	Non-operating humidity	15% to 90% (non-condensing at ambient)
	Operating shock	N/A
	Non-operating shock	65 inch 2.9 ms, six surface; 30g 266 inch/second; 50g 266 inch/second six surface
	Operating vibration	2-g peak acceleration

Technical Specifications - Input/Output Devices

	Non-operating vibration	Starting at 5 Hz, vary the frequency of vibration from 5 to 500 Hz and back to 5 Hz at a Logarithmic sweep rate of 1 octave per minute.
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	29.93 in (76 cm) on concrete, 16-drop sequence
Approvals	CUL, ICES-003 Class B, FCC, CE Mark,TUV GS, VCCI, BSMI, C-Tick, KC	
Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	

HP USB Smart Card (CCID) Keyboard		
Key Benefits:	• Protects against unauthorized access with smart card technology • Delivers even greater security when combined with a HP ProtectTools smart card and the HP ProtectTools Security Software • Combination of username and password or pin with a smart card or security token • Secures online transactions using digital signatures and certificates • Conforms to industry standards for ease of setup and use • Delivers long product life and quiet operation with high-impact materials and lubricated keys • Spill drain feature	
Physical Characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country
	Form factor	USB basic smart card keyboard
	Colors	Carbonite/Silver
	Dimensions (H x W x D)	18.2 x 6.3 x 1.3 in (46.3 x 16.1 x 3.3 cm)
	Weight	2 lb (0.9 kg) minimum
Electrical	Operating voltage	+ 5VDC ± 5%
	Power consumption	100-mA maximum (with four LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC 99 - 2001	Functionally compliant
Mechanical	Languages	30+ available

Technical Specifications - Input/Output Devices

	Keycaps	Standard design
	Switch actuation	55 g nominal peak force with tactile feedback
	Switch life	20 million keystrokes (using Hasco modified tester)
	Switch type	Contamination-resistant membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	6 ft (1.8 m)
	Microsoft PC 99 - 2001	Mechanically compliant
Environmental	Acoustics	43-dBA maximum sound pressure level
	Operating temperature	50° to 122° F (10° to 50° C)
	Non-operating temperature	-22° to 140° F (-30° to 60° C)
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	20% to 80% (non-condensing at ambient)
	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence
SmartCard Function	Support	All ISO 7816 smart cards (FIPS 201)
	Interface	Reads from and writes to all ISO7816-1, 2, 3, 4 memory and microprocessor smart cards (T=0, T=1)
	Chipset	SCM STCII
	Standard APIs supported	PC/SC, EMV2000, SET
	Power	USB Port
		Short circuit detection (protects smart card and reader)

Technical Specifications - Input/Output Devices

		Power supply compliant with ISO7816 and EMV (5V, 60 mA)	
		Supports 3-V and 5-V cards	
	Power consumption	100-mA maximum draw	
	Communication	From card	9600 bps to 330,000 bps
		From computer	12 Mbps (USB transfer speed)
	Landing mechanism	Contact device	Friction contact
		Card insertions rating	Up to 100,000 insertion cycles
	Interface modes	CCID protocol	
	Reader performance interface	USB connection	
	Electro-magnetic standards	Europe	2004/108/EC
		USA	USAFCC part 15
Approvals	CE-Mark, UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC, EMV2000, USB-IF		
Ergonomic Compliance	ISO 9241-4, TUVGS		
Kit Contents	Keyboard, I/O Security and Documentation CD, warranty card		

HP USB PS/2 Washable Keyboard

Physical Characteristics	Keys	104 (US) Layout, 105 (EU) layout – depending upon country
	Dimensions (L x W x H)	17.67x 6.62 x 1.38 in (449 x 168 x 35 mm)
	Weight	1.7 lb (0.77 kg) minimum
Electrical	Operating voltage	+ 5VDC ±5%
	Power consumption	50-mA maximum (with three LEDs ON)
	System interface	USB Type A plug connector
	ESD	CE level 4, 15-kV air discharge
	EMI - RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC 99 - 2001	Functionally compliant
Mechanical	Keycaps	Stepped -profile design
	Switch actuation	55-g nominal peak force with tactile feedback
	Switch life	20 million keystrokes

Technical Specifications - Input/Output Devices

	Switch type	Contamination-resistant switch membrane
	Key-leveling mechanisms	For all double-wide and greater-length keys
	Cable length	7 ft (2.2 m)
	Microsoft PC 99 - 2001	Mechanically compliant
	Acoustics	43-dBA maximum sound pressure level
Environmental	Operating temperature	50° to 122° F (10° to 50° C)
	Non-operating temperature	4° to 149° F (-20° to 65° C)
	Operating humidity	10% to 95% (non-condensing at ambient)
	Non-operating humidity	0% to 95% (non-condensing at ambient)
	Operating shock	40 g, six surfaces
	Non-operating shock	80 g, six surfaces
	Operating vibration	2-g peak acceleration
	Non-operating vibration	4-g peak acceleration
	Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
	Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence
Operating system support	Windows 8, Windows 7, Windows Vista, Windows XP Professional	
Approvals	UL, cUL, FCC, CE, TUV GS, VCCI, BSMI, C-Tick, KCC, USB-IF, WHQL, EN/IEC 60601-1, IP66/NEMA4X	
Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	

HP PS/2 Mouse		
Dimensions (H x L x W)	1.46 x 2.48 x 4.53 in (3.70 x 6.29 x 11.50 cm)	
Weight	3.53 oz (100g; +10g/- 5 g)	
Environmental	Operating temperature	-32° to 104°F (0° to 40° C)
	Non-operating temperature	-4° to 140°F (-20° to 60° C)
	Operating humidity	10% to 90% (non condensing at ambient)
	Non-operating humidity	10% to 90% (non condensing at ambient)
	Operating shock	40 g, 6 surfaces
	Non-operating shock	80 g, 6 surfaces

Technical Specifications - Input/Output Devices

	Operating vibration	2 g peak acceleration
	Non-operating vibration	4 g peak acceleration
	Drop (out of box)	80 cm height onto asphalt tile over concrete or equivalent, 5-drop in 5 direction except the cable face
Electrical	Operating voltage	5 VDC ± 10%
	Power consumption	100mA
	System consumption	PS/2 mini-din connector
	ESD	CE level 4, 15 kV air discharge
	EMI-RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC99 - 2001	Functionally compliant
Mechanical	Resolution	800 DPI
	Tracking speed	10 in/s (25.4 cm/s) maximum
	Acceleration	±15%
	Switch actuation	65±20 gf
	Switch life	3,000,000 operations (using Hasco modified tester)
	Switch type	Low force micro-switches
	Tracking mechanism life	80 km
	Cable length	6 ft (1.8 m)
	Microsoft PC99 - 2001	Mechanically compliant
Scroll wheel	Width	6 mm
	Diameter	22.5 ± 0.2 mm
	Maximum rotation force	50 gf-cm
	Switch type	Light force micro-switch
	Switch life	1 million operations
	Mechanical life	Minimum 200,000 revolutions
Regulatory Approvals	UL/cUL, FCC, CE Mark, TUV/GS, VCCI, KCC, BSMI, C-Tick	

Technical Specifications - Input/Output Devices

HP USB Mouse	
Dimensions (H x L x W)	1.5 x 4.5 x 2.5 in (3.7 x 11.5 x 6.3 cm)
Weight	0.22 lb (0.10 kg)
Cable length	70.9 in (180 cm)
System requirements	Available USB port

HP USB 1000dpi Laser Mouse		
Dimensions (H x L x W)	1.47 x 4.53 x 2.47 in (37.3 x 114.97 x 62.86 mm)	
Weight	3.360 oz (102g)	
Cable length	70.9 in (180 cm)	
System requirements	Available USB port	
Environmental	Operating Temperature	32° to 104° F (0° to 40° C)
	Non-operating Temperature	-4° to 140° F (-20° to 60° C)
	Operating Humidity	10% to 90% (non-condensing at ambient)
Mechanical	Resolution	1000dpi
	Tracking Speed	45 cm/sec
	Cable Length	70.9 in (180 cm)

HP USB PS/2 Washable Mouse		
Dimensions (H x L x W)	1.56 x 2.44 x 4.61 in (3.95 x 6.21 x 11.7 cm)	
Weight	4.44 oz (126 g)	
Environmental	Operating temperature	–32° to 104°F (0° to 40° C)

Technical Specifications - Input/Output Devices

	Non-operating temperature	–4° to 140°F (–20° to 60° C)
	Operating humidity	10% to 90% (non-condensing at ambient)
	Non-operating humidity	10% to 90% non-condensing
	Operating shock	40 g, 6 surfaces
	Non-operating shock	80 g, 6 surfaces
	Operating vibration	2 g peak acceleration
	Non-operating vibration	4 g peak acceleration
	Drop (out of box)	80 cm height onto asphalt tile over concrete or equivalent, 5-drop in 5 direction except the cable face
Electrical	Operating voltage	5 VDC ± 10%
	Power consumption	100mA
	System consumption	PS/2 mini-din connector or USB
	ESD	CE level 2 8 kV air discharge
	EMI-RFI	Conforms to FCC rules for a Class B computing device
	Microsoft PC99 - 2001	Functionally compliant
Mechanical	Resolution	1000 ± 20% DPI
	Tracking speed	14 in/s (35.56 cm/s) maximum
	Acceleration	2 g
	Switch actuation	70 g nominal peak force
	Switch life	3,000,000 operations (using Hasco modified tester)
	Switch type	Low force micro-switches
	Tracking mechanism life	8.8 ft total 70 cm+ 2m extension
	Cable length	Mechanically compliant

Technical Specifications - Input/Output Devices

	Microsoft PC99 - 2001	1000 ± 20% DPI
Scroll wheel	Width	6 mm
	Diameter	1 in (25.4 mm)
	Maximum rotation force	48 rats/sec
	Switch type	Light force micro-switch
	Switch life	3 million operations
	Mechanical life	Minimum 200,000 revolutions
Regulatory Approvals	FCC, CE Mark, ICES-003-B, IP66/NEMA4X	

Technical Specifications – Power

Unit Environment and Operating Conditions

General Unit Operating Guidelines

- Keep the computer away from excessive moisture, direct moisture and the extremes of heat and cold, to ensure that unit is operated within the specified operating range.
- Leave a 10.2 cm (4 in) clearance on all vented sides of the computer to permit the required airflow.
- Never restrict airflow into the computer by blocking any vents or air intakes.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- Occasionally clean the air vents on the front, back, and any other vented side of the computer. Lint, dust and other foreign matter can block the vents and limit the airflow.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.

Temperature Range	Operating: 50° to 95° F (10° to 35° C)* Non-operating: –22° to 140° F(–30° to 60° C)
Relative Humidity	Operating: 10% to 90% (non-condensing at ambient) Non-operating: 5% to 95% (non-condensing at ambient)
Maximum Altitude (unpressurized)	Operating: 10,000 ft (3048 m) Non-operating: 30,000 ft (9144 m)

*Operating temperature is de-rated 1.0 deg C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level, no direct sustained sunlight. Maximum rate of change is 10 deg C/Hr. The upper limit may be limited by the type and number of options installed.

POWER SUPPLY

Standard Efficiency	300W & 180W active PFC (230 VAC input only) 300W & 180W Reg (115V/230 VAC)
High Efficiency* 80 PLUS Bronze	300W & 180 active PFC EStar 6 82/85/82% efficient at 20/50/100% load (115V) 82/85/82% efficient at 20/50/100% load (230V)
Rated Voltage Range	200 - 240 VAC (300W & 180W active PFC) 100 - 240 VAC (300W & 180W ENERGY STAR® 6) 115 VAC/230 VAC (300W & 180W Reg)
Rated Line Frequency	50/60 Hz
Operating Line Frequency	47 – 63 Hz
Rated Input Current	4A/200 VAC, 8A/100 VAC
Rated Input Current with Energy Efficient* Power Supply	6.3A/100 VAC
Current Leakage (NFPA 99)	<900uA / 230 VAC (300W PSU)
Current Leakage with Energy Efficient Power Supply	<600uA / 230 VAC
Power Supply Fan	80mm Fan
Power cord length	6.0 ft. (1.83 m)
External Power Adapter	
Dimensions	N/A
Total Cord Length	N/A

*High efficiency power supply is a requirement for ENERGY STAR® qualification in conjunction with a select range of processors and modules

Technical Specifications – Weights & Dimensions

WEIGHTS & DIMENSIONS
(CONFIGURED WITH 1 HDD & 1 ODD)

Chassis (W x H x D)	182.88 X 357 X 402 mm 7.2 x 14.05 x 15.82 in
System Volume	21.02L
System Weight*	6.5 kg 14.33 lb
Max Supported Weight (desktop orientation)	N/A
Tower Stand (H x W x D)	N/A
Packaged (H x W x D)	496 x 240 x 520 mm 19.53 x 9.45 x 20.47 in
Shipping Weight	Est. 9.058 kg (19.969 lb)
Palletization Profile	2 x 5 = 10 -units per layer 4-layer max. 40-units per pallet

Technical Specifications – Miscellaneous Features

MISCELLANEOUS FEATURES

Management Features

- Advanced Configuration and Power Management Interface (ACPI). Allows the system to wake from a low power mode. Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.
- Intel Wired for Management support; industry wide initiative to make Intel architecture based PCs, servers and mobile computers more inherently manageable out-of-the-box and over the network
- Dual State Power Button; acts as both an on/off button and a suspend-to-sleep button

Serviceability Features

- Dual colored power LED on front of computer to indicate either normal or fault condition
- Diagnostic LED Explanation Table:
  - Number of 1-second red LED blinks followed by a 2-second pause, then repeats:
    - 2 - processor thermal protection activated
    - 3 - processor not installed
    - 4 - power supply failure
    - 5 -- memory error
    - 6 - video error
    - 7 - PCA failure (ROM detected failure prior to video)
    - 8 - invalid ROM, boot block recovery mode
    - 9 - system not fetching code
    - 10 - system hang while loading an option ROM
- HP PC Hardware Diagnostics UEFI:
  - This utility enables hardware level testing outside the operating system on many components. The diagnostics can be invoked by pressing F2 at POST, and is available as a download from HP Support
- System/Emergency ROM
- Flash ROM
- CMOS Battery Holder for easy replacement
- Flash Recovery with Video Configuration Record Software
- 5 Aux Power LED on System PCA
- Processor ZIF Socket for easy Upgrade
- Over-Temp Warning on Screen (Requires IM Agents)
- Clear Password Jumper
- DIMM Connectors for easy Upgrade
- Clear CMOS Button
- NIC LEDs (integrated) (Green & Amber)
- Dual Color Power and HD LED - To Indicate Normal Operations and Fault Conditions
- Color coordinated cables and connectors
- Tool-less Hood Removal
- Front power switch
- System memory can be upgraded without removing the system board or any internal components
- Tool-less Hard Drive, CD & Diskette Removal
- Green Pull Tabs, and Quick Release Latches for easy Identification

Additional Features

	Description
Towerable Orientation	Product can be oriented as either a desktop (horizontal) or a tower (vertical)
Drive Lock	Implementation of the industry standard ATA Security feature set. When enabled, it prevents software access to user data on the drive until one or two user-defined passwords are provided.
Drive Protection System	DPS Access through F10 Setup during Boot

Technical Specifications – Miscellaneous Features

	A diagnostic hard drive self test. It scans critical physical components and every sector of the hard drive for physical faults and then reports any faults to the user
	Running independently of the operating system, it can be accessed through a Windows-based diagnostics utility or through the computer's setup procedure. It produces an evaluation on whether the hard drive is the source of the problem and needs to be replaced
	The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures
SMART Technology (Self-Monitoring, Analysis and Reporting Technology)	Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted
SMART I - Drive Failure Prediction	Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count
SMART II - Off-Line Data Collection	By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure
SMART III - Off-Line Read Scanning with Defect Reallocation	IOEDC: I/O Error Detection Circuitry Detects errors in Read/Write buffers on HDD cache RAM
SMART IV - End-to-End CRC for hard drives	Interface in F10 setup provides confirmation of SMART IV support.

After-Market Options (availability may vary by region)

Business Monitors

	Part Number
HP ProDisplay P191	C9E54AA
HP ProDisplay P201	C9F26AA
HP ProDisplay P221	C9E49AA
HP ProDisplay P17A	F4M97AA
HP ProDisplay P19A	D2W67AA
HP ProDisplay P231	E4S07AA
HP EliteDisplay E201	C9V73AA
HP EliteDisplay E221	C9V76AA
HP EliteDisplay E231	C9V75AA
HP EliteDisplay E190i	E4U30AA
HP EliteDisplay E241i	F0W81AA
HP EliteDisplay E271i	D7Z72AA
HP EliteDisplay E221c	D9E49AA
HP EliteDisplay S230tm	E4S03AA
HP L2206tm	B0L55AA

Communication Devices

	Part Number
Intel Ethernet I210 – T1 Gbe NIC	E0X95AA
Intel 7260 802.11 a/b/g/n PCIe x1 WLAN Card	F2P07AA

Graphics Solutions

	Part Number
AMD Radeon HD 8350 Graphics (PCIe x16)	E1C63AA
AMD Radeon HD 8490 Graphics Card	E1C64AA
Nvidia NVS 310 Graphics (PCIe x16)	A7U59AA
Nvidia NVS 315 Graphics (PCIe x16)	E1C65AA
HP DisplayPort Cable Kit	VN567AA
HP DisplayPort To Dual Link DVI-D Adapter	NR078AA
HP DisplayPort To DVI-D Adapter	FH973AA
HP DisplayPort to HDMI Adapter	BP937AA
HP DisplayPort to VGA Adapter	AS615AA
HP DMS-59 to Dual DVI Cable	DL139A
HP DMS-59 to Dual DisplayPort Adapter	XP688AA
Dual Output USB Graphics Adapter	C5U89AA

Data Storage Drives and Accessories

	Part Number
HP 1-TB 7.2K rpm SATA 6.0Gb/s 3.5” Hard Disk Drive	QK555AA
HP 1-TB 10K rpm SATA 6.0Gb/s 3.5” Hard Disk Drive	C2T91AA
HP 500-GB 7.2K rpm SATA 6.0Gb/s 3.5” Hard Disk Drive	QK554AA
Intel Pro 1500 180GB SATA SED Opal1 SSD	G4M04AA

After-Market Options (availability may vary by region)

HP 128-GB SATA 3.0Gb/s Solid State Drive	QV063AA
HP 500-GB SATA 3.0Gb/s Solid State Hybrid Drive	E1C62AA
HP Slim Removable SATA Hard Drive Enclosure (frame & carrier)	C1N41AA
HP Slim Removable SATA Hard Drive Enclosure (carrier only)	AR639AA

Input Devices

	Part Number
HP USB Keyboard	QY776AA
HP USB Gray Keyboard (EMEA only)	B6B64AA
HP USB Smart Card (CCID) Keyboard	E6D77AA
HP USB Keyboard and Mouse Kit	B1T09AA
HP USB and PS/2 Washable Keyboard and Mouse Kit	BU207AA
HP PS/2 Mouse	QY775AA
HP USB Mouse	QY777AA
HP USB 1000dpi Laser Mouse	QY778AA
HP Wireless Keyboard and Mouse Combination	QY449AA

System Memory

	Part Number
HP 4GB DDR3-1600 (PC3-12800) DIMM	B4U36AA
HP 8GB DDR3-1600 (PC3-12800) DIMM	B4U37AA

Multimedia Devices

	Part Number
HP Slim DVD-ROM Drive	VP033AA
HP Slim SuperMulti DVD Writer Drive	QS209AA
HP USB HD 720P v2 Business Webcam	D8Z08AA
HP Business Headset	QK550AA
HP Business Speakers	D9J19AA

Security Devices

	Part Number
HP UltraSlim Cable Lock	H4D73AA

Stands and Accessories

	Part Number
HP (10 Sets) 400 G2 Bezel Support Kit	TBD
HP Serial Port Adapter (RS-232 compatible)	PA716A
HP Parallel Port Kit	KD061AA
HP PCI Expansion Kit	E1V16AA

LANDesk Software (E-Delivery)

Contact your HP representative for available options.

After-Market Options (availability may vary by region)

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April 2014

Change Log

Date of change:	Version History:		Description of change:
May 22, 2014	From v1.7 to v1.8	Replaced	180W disclaimer replaced with new wording.
June 10,2014	From v1.8 to v2	Update	Update System Volume
		Update	Per Jeff request added the headings to the file